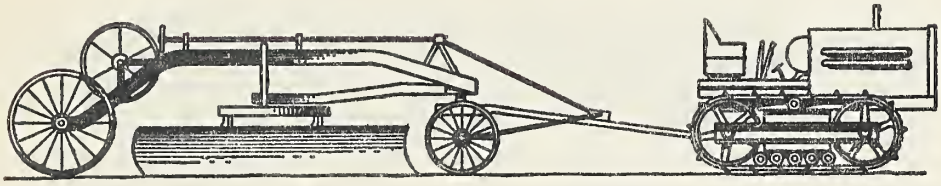
CONSTRUCTION



HINTS

UNITED STATES DEPARTMENT OF AGRICULTURE, FOREST SERVICE
WASHINGTON, D.C.

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Effective with this issue the editorship of Construction Hints changes. Mr. Friend, the former editor, is no longer connected with this office, having transferred to Spokane, Washington.

The purpose of Construction Hints is an exchange of practices found by the different Regions to be of value in their work. It seems appropriate to include information similar to the comparative costs for excavation, using powder and using tractor and ripper appearing on page 2. This information was furnished by Forest Engineer, William P. Lee, of the Tahoe National Forest. The editor will appreciate additional information relative to construction for inclusion in future issues.

Mr. W. D. Smith, Region 6, while on detail to the Washington Office, prepared, at the request of the Chief, Division of Engineering, a memorandum on lookout tower erection. This memorandum, including an illustration of an "A" frame appears in this issue.

A portable saw filing rack or vise, devised by Mark Johnson, Mt. Hood Forest, appears on page 8. This device has been successfully used in Region 6.

E. S. Massie, Jr.,
Editor.

We have arrived at the following comparative costs for excavation of rock on the Michigan Bluff Truck Trail:

Cost per cubic yard, using powder	$0.098
Cost per cubic yard, using RD-8 and ripper	0.021.

These costs were taken from a typical section of the Michigan Bluff Truck Trail being constructed through Calaveras slate. The rock is hard enough to have required drilling if only light equipment was used, but with an RD-8 and a large LeTourneau ripper no drilling or powder is necessary. The costs for the use of powder include rent and operation of equipment, pay of jackhammer men, cost of powder, caps, wire, etc., and pay of powder man. The cost for the use of the RD-8 and ripper include rent and operation of equipment, cost of ripper teeth, etc., and pay of operator. The cost of removal of material after being prepared for either end hauling or overcasting will be the same in either case, and is not figured into these costs. It must be realized that the difference will increase or decrease with different types and hardness of the rock being excavated. It also must be realized that the saving of $0.077 we show will not apply to the total yardage of the job as some of the material is so soft that it would not require blasting in any case and some is so hard that even the RD-8 and large ripper will not handle it, making drilling and blasting necessary. Our estimated saving due to the heavy ripping equipment on our total season's work last year was $0.018 per cubic yard for 100,000 cubic yards.

The foregoing figures are comparatively easy to get and are relatively accurate, but there is an even greater saving that would be difficult to figure at a definite savings per yard. I refer to the large saving in maintenance cost, especially the first few years due to bank slough. The banks of a road that has been drilled and shot are badly shaken and a heavy slough must be expected every winter for a number of years, whereas the bank of a road that has been put down to grade with a ripper is undisturbed and there will be a relatively small amount of slough.

Wm. P. Lee, Forest Engineer,
Tahoe National Forest.

Memorandum on Lookout Tower Erection:

It is not the purpose of this memorandum to outline a procedure of erection that will be mandatory on field forces, but rather to suggest some methods that may be of assistance to construction men, particularly foremen not experienced in tower erection.

Study of Plans:

Before starting erection the foremen should study the plans until he is familiar with the structure to be erected. He should outline his method of erection, list and assemble all equipment that will be required, determine the size of crew needed, and in general attend to all details that will contribute to uninterrupted erection after starting.

Handling of Materials:

All creosoted timber must not be handled with cant hooks, pike poles, wire rope slings or in any way that will puncture the creosoted wood or expose untreated wood to decay. If boring of treated timbers is necessary, the holes should be treated with hot creosote by a pressure bolt hole treating gun which may be obtained from the creosoting plant. If timber must be stored any considerable time before erection, it should be close piled on at least three parallel skids or sills, not less than 6" above the ground surface. Care must be taken that the skids are level and that the timber is supported by all three.

Steel tower members should be stored under cover if possible, on a level floor; care should be used to avoid bending the lighter members and gusset plates and breaking the galvanizing coat.

When the foundations are complete and before the erection is started, all material should be sorted and arranged on the sides of the tower in the order the various members are to be needed, the first ones needed being closest to the tower. At the same time, all bolts should be sorted by sizes and lengths and stored in boxes or bins with the size and length plainly marked, and the number of each size checked so as to avoid shortages which will hold up erection after it is started. This will enable selection of the right length of bolts without delay. Care should be taken that the bolts are used properly as the use of longer bolts than necessary will cause a shortage of that size when needed.

Steel Tower Erection:

Members in steel towers are light, the heaviest being the corner posts for the bottom panel, weighing not more than 330 pounds. Stari runs weigh about 165 pounds. The heaviest members are in the 120 foot heights and the post weight decrease in the upper stories. Therefore, it will not be necessary to use a gin pole or derrick on steel tower erection. All pieces can be more readily handled by means of block and tackle and many pieces can be easily carried by one man.

The following procedure is suggested:

1. Set lower story posts and hold in place by anchor bolts.
2. Set horizontal struts just below post splices and bolt tight.
3. Set diagonals in first story and then fill in other horizontals and the hanger from the intersection of the diagonals to the lower horizontal.
4. Set all stair landing beams and put in stair stringers, stair treads and landing plank.
5. Using 2" plank (which must be bought for the job) build working platforms at the stair landing elevation resting the plank on the horizontals and the members which run diagonally across the corners at the landing levels.
6. Repeat for each story until erection is completed.

In setting posts above the first story, the posts should be brought up and set one at a time. Using the bolt holes in the top of the lower post, bolt a 4" x 4" to the outside of the lower post. Rig a three part tackle to the top of the 4" x 4" and hoist the top post into place, and bolt one splice plate tight. This will hold the post in place while the 4" x 4" is removed and the second splice plate bolted on.

Wood Tower Erection:

As some posts weigh nearly 750 pounds it will be necessary to have a gin pole or "A" frame and tackle to lift and set the posts. Such a pole should be about 20 feet long and be light so that it can be easily moved and set up. The "A" frame shown on the accompanying drawing is recommended as it has a broad base and when set in the right location to make a lift does not require any side guys.

The following procedure is suggested:

1. Take bottom story posts and bolt the two diagonals at its top loosely in place. Set "A" frame in position to make the lift and guy to foundation diagonally across from

the post to be lifted. Pick up post keeping the ends of the diagonals free from the ground. Set post on dowels. Drive 2" x 4" stakes and lash lower ends of diagonals to them. Move "A" frame and set the other three posts in the same way. Unlash diagonals and bolt to lower end of posts.

2. Put in lower and upper horizontal struts. Horizontal struts may be lifted by block and tackle at each end fastened to top posts. Set landing platform stringers and stairs completing landings and stairs as you go up.

3. For setting second story above ground, build working platform at first landing level of 3" plank laid across the upper set horizontals. In the lower stories where the span between horizontals is comparatively large the plank should be supported at the center by a pole running across the towers.

4. When platform is complete, set up "A" frame for lifting one post and guy to top post diagonally across. Bolt diagonals loosely to top of post to be erected and lift into place. The lower ends of each diagonal should be handled by one man who can make the connection at the top of the lower story posts. Set and bolt up splice plates. Before raising posts the ground crew should place all split rings in the posts. Splice plates and posts are all match-marked and the match-marking diagram must be followed in erection or the connecting holes will not fit.

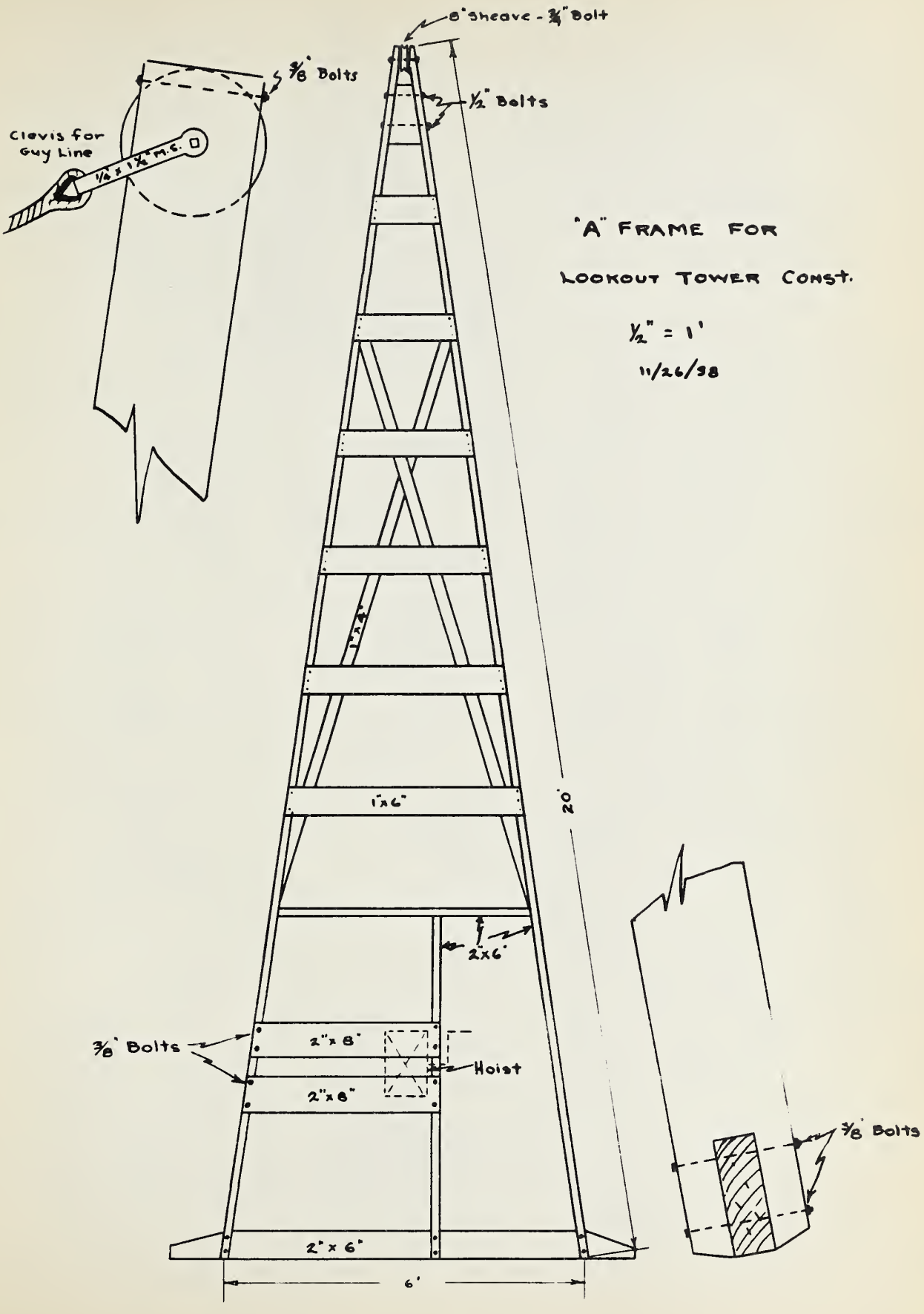
5. After posts and diagonals are bolted up, place and bolt up horizontal struts.

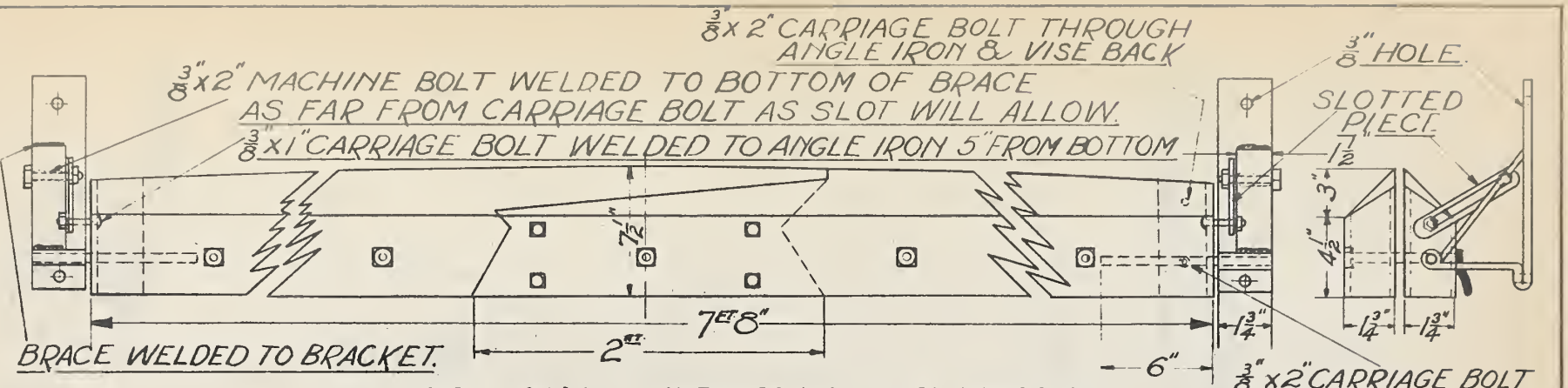
6. Repeat procedure for each succeeding story.

When the tower is erected to the point where the guy cables are fastened, the guys must be placed before proceeding with the erection. At this point, the tower should be plumbed by means of the guy cables.

The success and speed of erection depends on a thorough understanding of the plans, a well thought out erection procedure, and the training of the men in their parts of the work so that they all work smoothly together. As far as possible all features of the erection should be anticipated so that unnecessary delays can be eliminated.

/s/ W. D. SMITH,
Associate Structural Engineer.

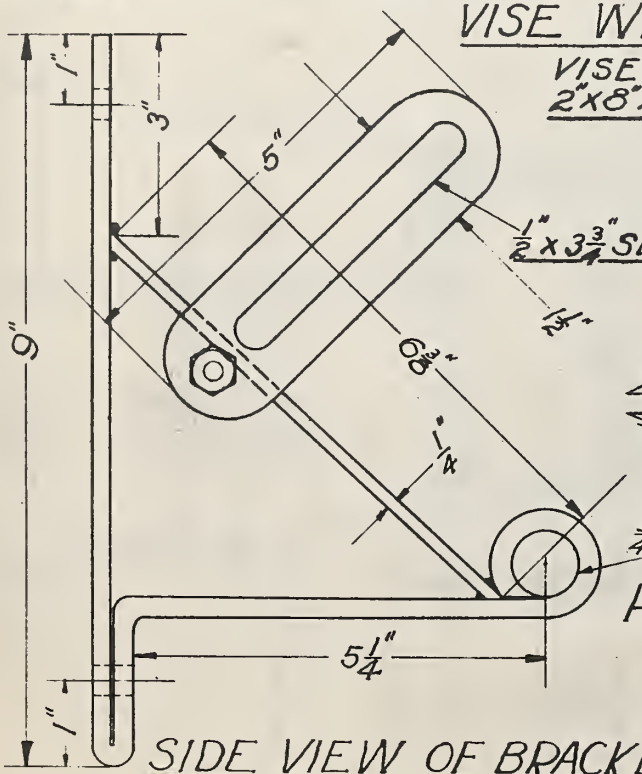

8" Sheave - ¾" Bolt
⅜" Bolts
½" Bolts
Clevis for Guy Line
¼ x 1½" M.S.
"A" FRAME FOR
LOOKOUT TOWER CONST.
½" = 1'
11/26/98
1"x6"
20'
2"x6"
⅜" Bolts
2"x8"
Hoist
2"x8"
⅜" Bolts
2" x 6"
6'



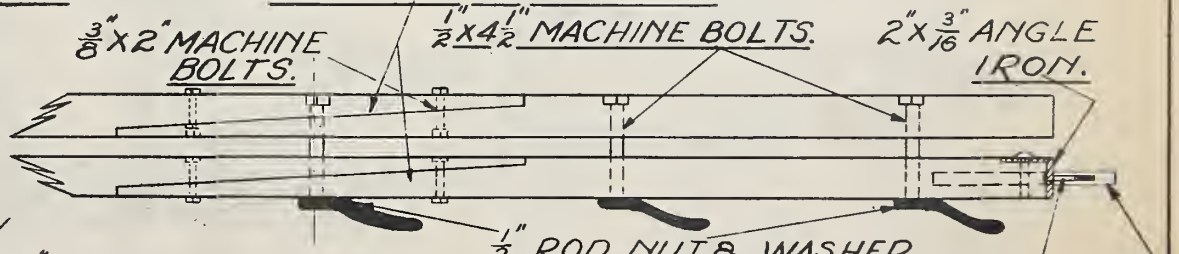
VISE WITH BRACKETS ATTACHED.

VISE PROPER MADE OUT OF 4 PIECES 2"x8"x5" ROUGH OR S4S FIR.

3/8" x 2" CARRIAGE BOLT THROUGH CENTER OF 13/16" ROD AND ANGLE IRON LIP ON FACE OF BACK ONE INCH FROM EXTREME END.



DOVE TAILED, TAPERED MORTISE JOINT 2 FEET LONG.



PORTABLE SAW FILING RACK OR VISE

SIDE VIEW OF BRACKET

MADE FROM FRONT CHEV. OR FORD SPRING LEAF.

U. S. FOREST SERVICE, REGION 6
MECHANICAL IMPROVEMENTS & REPAIRS
PORTABLE SAW FILING RACK OR VISE
SUBMITTED BY MARK JOHNSON.
FOREST MT. HOOD. DATE 5-6-38
PORTLAND, ORE. SKETCH 053